THE IMPACT OF MACROECONOMIC VARIABLES ON STOCK MARKET RETURNS IN KENYA

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ABSTRACT

This study investigates the impact of the macroeconomic variables on stock returns in Kenya during the period 2003- 2013, using the Arbitrage Pricing Theory (APT) and Capital Asset Pricing Model (CAPM) framework for monthly data. The Ordinary Least Square (OLS) technique is applied to test the validity of the model and the relative importance of different variables which may have an impact on the stock returns. The empirical analysis found two interesting results. First, all variables are I(0). Second, with the exception of interest rates, there exists a significant relation between stock market returns and macroeconomic variables. According to the findings of the study, Money Supply, exchange rates and inflation affect the stock market returns in Kenya. Money supply and inflation are found to be significant determinants of the returns at NSE. Exchange rates is however, found to have a negative impact on stock returns, while interest rates is not important in determining long rung run returns in the NSE.

Key Words *stock market returns, Nairobi Securities Exchange,Ordinary Least Square (OLS), Arbitrage Pricing Theory (APT), and Capital Asset Pricing Model.*

1. INTRODUCTION

Stock market plays a major role in financial intermediation in both developed and developing countries. The stock market avail long-term capital to the listed firms by pooling funds from different investors and allow them to expand in business by offering investors alternative investment avenues to put their surplus funds. Stock market index in this regard provides a historical stock market performance, the yardstick to compare the performance of individual portfolios. Stock market makes it possible for the economy to ensure long-term commitments in real capital (Ologunde et al., 2006)

The changes in macroeconomic factors have a diverse effect across the economic spectrum, although the recent innovations in macroeconomic fundamentals are lacking in emerging markets like Kenya. According to the Economic Survey 2013, (GoK, 2013), performance of the stock market improved during the year 2012. The NSE 20 Share Index rose by 29.0 per cent to 4,133 from 3,205 in December 2011. During the same period annual inflation decreased from 14.0 per cent in 2011 to 9.4 per cent in 2012. The year 2011/2012 was especially characterized by bullish foreign investor participation in the equity market averaging 45% of the total turnover due to currency depreciation. However, during the second quarter of 2012, the market experienced a rebound of sorts largely due to easing of inflationary and exchange rate pressures. (Capital Markets Authority 2012)

Vast studies in the emerging markets show a relationship between macroeconomic variables and stock market performance. These include Naik (2013) who investigated the relationships between the Indian stock market index and industrial production index, wholesale price index, money supply, treasury bills rates and exchange rates. Osamuonyi and Evbayiro-Osagie (2012) investigated the relationship between macroeconomic variables and the Nigerian capital market index. Ochieng and Oriwo (2012) studied the relationship between macro-economic variables and stock market performance in Kenya.

With the exception of Ochieng and Oriwo (2012), most of the previous studies in the Kenyan context focus on the economic performance and stock market growth. Ochieng and Oriwo (2012) study cannot give much credence to policy due to the fact that the period of study is not long enough to establish a reliable trend; the study also employed data for the entire share index, which includes even non performing firms in the NSE. Basing on the shortcoming therefore, the present study seeks to determine the impact of Money Supply, measured by M2, Exchange rate, Inflation(measured by Consumer Price Index), and interest rates (measured by 91- Day Treasury Bill rates) on stock market returns, using ten year monthly data for the period of 2003 to 2013

The current study is built on the premise of the previous findings from both developed and developing countries. These studies present powerful and interesting conclusions which become of interest to Kenya. The potent findings by Maysami *et al* (2004) which has invited several interests and citations among researchers alike, through the variables investigated presents a scenario for this study in Kenyan perspective. Among many other studies that have presented a relationship between macroeconomic variables and stock market in the developing countries include (Abraham, 2010; Naik, 2013; Adarmola, 2012; Olweny and Omondi, 2011).the objective of the study is to determine the impact of selected macroeconomic variables on stock market returns in Kenya, these variables include Money supply (M2), Exchange rates, Inflation (CPI) and interest rates (91 T bill rates)

1.1 Objectives of the Study

1. The impact M2 money supply, exchange rates, inflation (CPI) and Interest rates (91 T-bill rates) on stock returns (captured by NSE 20-share index) in Kenya.
2. The appropriate policy measures regarding the dynamics of macroeconomic variables (money supply (M2), exchange rate, inflation rate, and interest rates measured by 91 T-bill rates and their resultant effect on the Stock market returns in Kenya.

2. LITERATURE REVIEW

The nexus between macroeconomic fundamentals and stock market returns has been a major topic of engagement within the financial economics circus. This nexus is an object of on-going interest of investors, academics and policymakers. Several theories and empirical evidence alike have shown much detail on this subject of concern to economies. Literature, such as that by Sharpe (1964), Lintner (1965), Ross (1976), has provided a theoretical basis by which stocks may be valued. However, the simplifying assumptions, upon which many of these models are derived and based, present key weaknesses. These weaknesses become increasingly evident in the implementation and practical application of the model in reality. Nonetheless, from a theoretical point of view, these models present a sound theoretical foundation on which stock market movement may be attributed to the influences of the macroeconomic factors.The Capital Asset Pricing Model (CAPM) and Asset Pricing Theory (APT) are adopted in this study to underpin the relationship between the stock market and the economic activities.

2.1 Capital Asset Pricing Model and Arbitrage Pricing Theory

The Capital Asset Pricing Model was developed by Sharpe (1964), Lintner (1965, 1969) and Mossin (1966), to investigate the effects risk had on the expected return of an investment relative to the market portfolio. The capital asset pricing model relates the expected return of an asset to its riskiness measured by the variance of the asset's historical rate of return relative to its asset class. The model decomposes a portfolio's risk into systematic and specific risk. Systematic risk is the risk of holding the market portfolio. To the extent that any asset participates in such general market moves, that asset entails systematic risk. Specific risk is the risk which is unique to an individual asset. It represents the component of an asset's return which is uncorrelated with general market moves.

In their recent study to validate the model, (Fama & French, 2004), fronts the portfolio theory that investors choose portfolios that are said to be mean-variance-efficient, and found along the efficient frontier for portfolios. The CAPM assumes that any portfolio that is mean-variance-efficient and lies on the efficient frontier is also equal to the market portfolio. The implications of this, according to the authors, are that the relation between risk and expected return for any efficient portfolio must also hold for the market portfolio, if equilibrium is to be maintained in the asset market. The model is presented in the following linear form;

$$R_t = \alpha + \beta X_t + \varepsilon_t \quad \text{.....2.1}$$

Where R_t represents the return to an asset, X_t represents the return of an underlying portfolio of assets (often measured as a domestic market index), and ε_t represents the asset-specific return, all at time t. The key term in the Dmodel is β (i.e. beta), which indicates the statistical relationship between the asset's return and the return on the total portfolio of the assets.

According to the capital asset pricing model (CAPM), the marketplace compensates investors for taking systematic risk but not for taking specific risk. This is because specific risk can be diversified away. When an investor holds the market portfolio, each individual asset in that portfolio entails specific risk, but through diversification, the investor's net exposure is just the systematic risk of the market portfolio.

Another framework to the CAPM is the arbitrage pricing theory (APT) by (Ross, 1976) in which the return on an asset is specified as a function of a number of risk factors common to that asset class. The model assumes that investors take advantage of arbitrage opportunities in the broader market; thus, an asset's rate of return is a function of the return on alternative investments and other risk factors. The APT in contrast to CAPM acknowledges several sources of risk that may affect an asset's expected return. The model attributes the expected return of a capital asset to multiple risk factors, and in the process measures the risk premiums associated with each of these risk factors.

An arbitrage model takes the following form:

$$R_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + ... + \beta_n X_n + \varepsilon_t \quad \text{.....2.2}$$

The model is similar in form to equation 2.1, except that the X's represent a set of risk factors common to a class of assets, and the betas represent the sensitivity of the asset's return to each factor. Arbitrage Pricing Theory addresses the question of whether the risk associated with the particular macroeconomic variable is reflected in the expected market returns. According to (Chen, Roll, & Ross, 1986), economic variables have a systematic consequence on stock market returns because economic forces affect discount rates, the ability of the firm to generate cash and future dividend payments. The core idea of APT is that only a small number of systematic influences affect the long term average returns of securities.

APT is however based on Multi-factor linear model. (Jecheche, 2006), argues that Multi-factor models allow an asset to have not just one, but many measures of systematic risk. Each measure captures the sensitivity of the asset to the corresponding pervasive factor. The author further contends that, the intuition for the result when assets have no specific risk, is that all asset prices move in lockstep with one another and are therefore just leveraged 'copies' of one other. The result becomes more difficult when assets luck specific risk. In such a case it is possible to form portfolios with a diversifiable specific risk. In order to achieve full diversification of residual risk, however, a portfolio needs to include an infinite number of securities. With a finite set of securities, each of which has specific risk, the APT pricing restriction will only hold only approximately.

Chen et al., (1986) in their first empirical investigation of the APT argued that the most basic level some fundamental valuation model determines the prices of assets. That is, the price of a stock will be the correctly discounted expected future dividends. Therefore the choice of factors should include any systematic influences that impact future dividends, the way traders and investors form expectations and the rate at which investors discount future cash flows.

It is through this mechanism that macroeconomic variables become part of risk factor in the equity market. The authors further concede that stock returns are exposed to systematic economic news, that they are priced in accordance with their exposures, and that the news can be measured as innovations in state variables whose identification can be accomplished through simple and intuitive financial theory.

Ferson and Harvey (1998) however, argue that the CAPM and APT have advantages and disadvantages as models of asset returns. The CAPM is seen as parsimonious and commonly employed by equity analysts, but requires a precious identification of the portfolio against which the asset is compared. On the other hand, Mosley and Singer(2007) contends that, APT accommodates multiple sources of risk and alternative investment, the model suffers from a similar challenge of identification since many factors, both international and domestic could influence an assets performance. The model, as with the CAPM, is subject to certain assumptions; the first of these being that investors may borrow and lend at the risk-free rate, there are no taxes and short selling of securities is unrestricted. The second assumption assumes that a wide variety of securities exist, thus risk unique to those securities may be diversified away, and lastly, investors are risk averse who aim to maximize their wealth.

The criticisms of the model have centred on the generality of the APT itself. The APT sets no theoretical foundations for the factors that should be included in ascertaining the risk-adjusted return of the capital asset, and furthermore does not state the number of risk factors that should be included. The APT also presents certain methodological issues relating to the estimation of the model. Cheng (1996) points out that the model may be sensitive to the number of independent variables included in the linear regression. Evidence of this was found by Günsel and Çukur (2007). However, in both cases it was found that the applicability of the APT in establishing asset returns may still be valid.

APT and CAPM can however be explained by a single model as demonstrated by Bailey (2005) "If asset returns are explained by a single factor model, where the single factor is the market rate of return, then the prediction of the APT is identical with that of CAPM. It is possible for the CAPM and APT to be compatible with one another even if the return on the market portfolio is not one of the factors-indeed, even if the factors are not Portfolio return at all." Therefore this study will employ the multifactor model to determine the impacts of macroeconomic variables (Money Supply M2, Exchange Rates, Inflation Rate, and Interest rates 91 T-bill rates) on the returns(NSE 20-Share index) in Kenya for the period of 20013 to 2013

2.2 Empirical Literature

Naik (2013) investigated the relationships between the Indian stock market index (BSE Sensex) and five macroeconomic variables, namely, industrial production index, wholesale price index, money supply, treasury bills rates and exchange rates. The study used monthly data for these variables over the period 1994:04–2011:06. The author employed Johansen's co-integration and vector error correction model (VECM) for their analysis. The result observed that in the long-run, the stock prices are positively related to money supply (M3). The study established that money supply causes stock prices only in the long-run but no causality from stock price to money supply as found either in the long run or in the short run. One possible explanation may be the fact that money supply changes have an indirect effect through their effect on real output which in turn impact the stock prices. Osamuonyi and Evbayiro-Osagie (2012)also arrived at the same finding when they attempted to determine the relationship between macroeconomic variables and the Nigerian capital market index. The study used yearly data of interest rates, inflation rates, exchange rates, fiscal deficit, GDP and money supply from 1975 to 2005 employing Vector Error Correction Model (VECM) to study the short-run dynamics as well as long-run relationship between the stock market index and the six selected macroeconomic variables from the Nigerian economy. Money supply (M2) was found to have a significant but negative relationship with Stock Market Index in both the short- run and long run.

Jamil and Ullah (2013) examined the impact of foreign exchange rates on stock prices for Pakistan by employing Co-integration Technique and Vector Error Correction Mechanism (VECM). Using monthly data from 1998 to 2009, they found that relationship exists between exchange rates and stock market returns, both in the short run and long run. The short run period was found to have a positive but significant relationship, while the long run relationship is not significant. The short run sensitivity of stock market returns to exchange rates indicates that the investments in the stock market are short term and most investors liquidate their stock within one year. Aurangzeb (2012) arrived at the same conclusion when the author examined the factors affecting performance of stock markets of South Asian countries using monthly data for the period of 1997 to 2010 of 3 South Asian countries namely, Pakistan, India and Sri Lanka. The study employed descriptive statistic method for the analysis. The result indicated that Exchange rates have significant positive impact on the performance of stock markets of the three markets of South Asia.

Adarmola(2012) found a similar findings when the author studied the exchange rate volatility and stock market behaviour in Nigeria, applied Johansen's Cointegration Technique and Error correction mechanism using quarterly data for the period of 1985 to 2009 and found that Exchange rate exerts significant impact on Nigerian stock market both in the short and in the long run. The study showed that in the short run, exchange rate had a positive significant impact on stock market performance; however, the results also showed that in the long run, the relationship is significantly negative.

Sharpe (2002) examined stock valuation and inflation for the time period of 1965-2001 to check this he collects monthly historical annual operating income for S&P500 from I/B/E/S International. The negative relation between equity valuations and expected inflation was found to be the result of two effects: a rise in expected inflation coincides with both lower expected real earnings growth and higher required real returns. The earnings channel mostly reflects a negative relation between expected long-term earnings growth and expected inflation. The effect of expected inflation on required (long-run) real stock returns is also substantial. He run the simple regression and concluded that there is strong negative relationship between stock returns and inflation.

Bordo et al.,(2008), while using latent Variable VAR to estimate the impact of inflation and other macroeconomic variable on stock market conditions, found that inflation have large negative impact on stock market conditions, apart from their real effects on real asset prices. The study employed a hybrid model that allowed the data to partly identify market conditions guided by their initial classifications of periods of exceptionally rapid and prolonged increase in real stock prices as booms and periods of significant declines as busts. (Reddy, 2012), contended that a reduction in inflation rate resulted in increased stock prices. The author used a regression analysis which showed that the variable accounted for up to 95.6% of the variations in stock prices for the period of 1997-2009.

The relationship between stock prices and interest rates has received considerable attention in the literature, though with mixed results. Using VECM model and yearly time series data for the period 1985-2008, Onasanya and Ayoola (2012) found that the stock macroeconomic variables do not significantly influence the return at the stock market. Interest rates, specifically was found to be negatively related and insignificant to stock market returns in Nigeria. Owusu-Nantwi and Kuwornu (2011) study of the impact of interest rates on stock market returns indicated that the variable is not significant for the stock market in Ghana. Interest rate as captured by 91-Treasury bill rate indicated a negative relationship with the stock market return when the authors employed Ordinary Linear Squares method with monthly data of 1992-

2008. The results of the study were however in agreement with several studies under review in this study. Uddin and Alam (2007) examine the linear relationship between share price and interest rate as well as share price and changes of interest rate. In addition, the also explore the association between changes of share price and interest rate and lastly changes of share price and changes of interest rate in Bangladesh. They find for all of the cases that Interest Rate has significant negative relationship with Share Price and Changes of Interest Rate has significant negative relationship with Changes of Share Price.

The results of Maysami et al., (2004) however, indicate a sharp contrast from the above findings, the study reports a significant positive relationship between interest rates and stock market returns in Malaysia. The authors employed monthly data for the period of 1989 to 2001 with a Vector Error Correction Model. The disparities in these studies present an opportunity to collect Kenyan data and find out the relationship as per Kenyan situation, this further informs the current study of the role of interest rates on returns in the NSE

2.3 Research Gap

From this literature review, several key conclusions can be drawn. First, while existing theories conjecture a link between macroeconomic variables and stock markets, they do not specify the type or the number of macroeconomic factors that should be incorporated. Thus, the existing empirical studies, reviewed in this chapter, have shown the use of a vast range of macroeconomic variables to examine their influence on stock prices (returns). Subsequently, while previous studies have significantly improved our understanding of the relationships between financial markets and real economic activity, the findings from the literature are mixed given that they were sensitive to the choice of countries, variable selection, and the time period studied. It is difficult to generalize the results because each market is unique in terms of its own rules, regulations, and type of investors.

The VAR framework, VECM method, cointegration tests, Granger causality tests, and GARCH models were commonly used to examine the relationships between stock prices and real economic activity. However, there is no definitive guideline for choosing an appropriate model. Finally, it is obvious that there is a shortage of literature concerning emerging stock markets, but it is particularly lacking in regards to the Kenyan Market. Indeed, of the empirical studies reviewed in this study, only two studies included the Kenyan market and examined the effect of the macroeconomic variables on its behaviour. Still on Kenyan markets, of the reviewed literature, no specific one has attempted to examine the short run and long run dynamics of these variables on stock returns. Therefore, this study, to the best of our knowledge, will be among the first empirical studies to consider the relationships between the Kenyan stock market returns and a set of macroeconomic variables from 2003 to 2013.

3. **RESEARCH METHODOLOGY**

We used monthly data for the sample period of January 2003 (M1) to January 20113(M12). The data series are transformed into rates of change by taking the log differences in each of the series in the form dLn (X) to generate the unanticipated components (i.e. the first difference of the variable of interest). We adopted the convention that time subscripts apply to the end of the period. It is important to mention that data are used in differences for two reasons. First, theoretical model of APT posits that variables should be used in return form. Second, economic time series data were assumed to be stationary. However, time series data can be non-stationary (trended) and this kind of data can be regarded as potentially a major problem for applied econometric studies. It is well known that trends may cause some problems (i.e.

spurious regression). Some authors have suggested a remedy, namely, to difference a series successively until stationarity is achieved.

3.1 Macroeconomic Variables

Numerous theoretical models have been used to establish linkages between asset prices and macroeconomic variables. Most of these models assume the basic valuation formula in the form of,

$$P_t = E_t \sum_{k=0}^{\infty} \frac{D(t+k)}{(1+\delta)^{k+1}} \quad \text{..... .... 3.2}$$

Where,

P(t): Price of a stock at time *t*.

Et: Conditional expectation operator given information available at time *t*.

D (1+k): Net cash flow of the firm available for distribution to shareholders at time *t+k.*

δ : Discount rate.

Any change in an asset's cash flows should have a direct impact on its price. Thus, the assets expected growth rates that influence its predicted cash flows will affect its price in the same direction. Conversely, any change in the discount rate should inversely affect the asset's price. A country's stock index therefore is affected by factors that influence its economic growth or bring about changes in its real rate of interest, expected rate of inflation, and risk premium.

Since our purpose is to find out whether the considered macroeconomic variables are important in explaining the Kenyan stock market return, we employed exogenous macro variables that affect the future cash flow or the risk adjusted discount factors in Equation (3.2) and as linearly represented in Equation (3.1) We used four macroeconomic factors, namely, money supply (M2), exchange rate, inflation (CPI) and interest rate (91-T bill rates) as candidates for systematic risk factors (i.e. factors that may carry risk premium in Kenyan stock market. The rationale to choose these factors stems from the results of previous studies. For example, we specify some of the factors used by Chen et al. (1986) and also include a number of others that shows previous findings in Kenya, Ghana, Nigeria, India and Malaysia such as Aurangzeb, (2012) Osamuonyi and Evbayiro-Osagie, (2012) Reddy, (2012) and Ochieng and Oriwo (2012).

The macroeconomic variables used in this study differ from the previous literature in term of the definition. Most of the previous studies related expected components of macroeconomic variables to expected returns. However, we used the "rate of change" methodology to generate the unanticipated components. Took the first difference then enters as an unexpected component in the multi-factor model. The macroeconomic factors used in the model are explained below in more detail.

3.2 The Method of Estimation

The regression analysis is used to identify the direction and significance of relations between Kenyan stock returns and the macroeconomic factors. The regressions are performed by utilizing the Ordinary Least Square (OLS) and to estimate the regression coefficients. Each regression coefficient estimated by OLS coincides with the true value on the average and they have the least possible variance i.e. they are efficient so that regression analysis can produce best linear unbiased estimates (BLUE).

We have one variable for exchange rate, one variable for money supply i.e. M2 so we estimated a model for NSE 20-Share index. In the regression equation, we included MS, EXR, CPI, and INT whilst

substituting NSE 20-Share index. The reasoning for doing so is to investigate the effects of different variables in combination with other variables. To test the significance of the individual coefficients, a t-test is performed. If the computed *t* values are larger than the critical value at a given level of significance, then the null hypothesis study that the given regression coefficient (risk premium) is not significantly different from zero is rejected i.e. individual risk premium is significant.

The R^2 is used to get the percentage of total variations in General share index returns explained by the macroeconomic variables employed in the multiple regression equation and F-test is used to test the overall significance of the model, that is, whether stock returns are linearly related to macroeconomic factors employed.

3.3 Stationarity Test

The classical regression model assumes that the dependent and independent variables are stationary over time that is, mean of zero and a constant variance. A casual inspection of data shows that money supply and inflation, exhibit long run trend movement and only become stationary after they are differenced (See Appendix 1). Applying the classical regression technique to the levels of variables leads to a spurious correlation, especially when the variables involved exhibit consistent trend either upward or downward, Geda *et al* (2012).

In order to conduct valid statistical inference, we must make a key assumption in time series analysis: We must assume that the time series we are modeling is covariance stationary. A time series is stationarity if its properties, such as mean and variance, do not change over time. A stationarity series must satisfy three principal requirements. If a time series that we model is not stationarity, the estimation results will have no economic meaning. For a nonstationarity time series, spurious results will be yielded. However, we can attempt to convert the data to a stationarity time series if the time series is nonstationarity. In statistical terms, we can differentiate it. Before that, we must determine whether a time series is stationarity. The tests ensure that shocks are only temporary and will dissipitate and revert to their long-run means. Currently, most popular test for nonstationarity is the Dickey-Fuller test for a unit rootDeFusco et al. (2007). Therefore, the Augmented Dickiey-Fuller (ADF) test is employed to determine whether there is a unit root in economic variables used in the study. ADF is applied to the level variables as well as to their first differences in logarithmic terms. The null hypothesis tested that the variables under investigation have a unit root, against the alternative that they do not have.

Augmented Dickey-Fuller tests whether ΔY is equal to 0 or not.

$$\Delta Y = \alpha + \gamma Trend + PY_{t-1} + \sum \sigma \Delta Y_{t-1} + \varepsilon_t \quad \text{.....4.1}$$

The ADF tests the null hypothesis (H_0) against the alternative (H_1) hypothesis;

H_0: Each economic variable has a unit root

H_1: Each economic variable does not have a unit root

At first, ADF test was performed on the variables in levels to determine the presence of unit roots. The results of the ADF test are reported in Table 5.The second column of Table 5 presents the test statistics for each variable for a unit root in levels.

The stock market returns null hypothesis is rejected in the test at levels at1 per cent, 5 per cent and 10 per cent levels of significance. The variable is found to have a constant mean, variance and covariance at levels; that is, it displays mean-reverting behaviour. The test statistics of (-10.228) proves

that the variable is stationary from (-3.481) critical values. For Money Supply (M2), null hypothesis of nonstationarity is rejected at test levels at 1, 5 and 10 per cent. The variable is stationary at levels.

The variable interest rates (91-Day Treasury bill) is stationary at I(0). The hypothesis of nonstationarity (unit root) is rejected at I(0) for interest rates both at 1 and 5 per cent. For CPI, the null hypothesis is accepted at I(0) with trend and intercept. The result suggests that the variable has constant moments, the mean, variance and covariance is constant hence satisfactory to the OLS assumptions (see appendices on unit root tests)

3.4 Empirical Results and Discussion

Table 6: The Effects of Macroeconomic Variables on Stock Market Returns

Variable	Notation	Model 1a:SR	Model 1b: SR
Constant	C	0.005136	-0.001669
		(0.4078)	(0.7795)
Money Supply	MS	1.394099	-
		(0.000)*	
Exchange Rates	EXCH	-0.432045	-0.398306
		(0.0412)**	(0.0601)***
Inflation(CPI)	CPI	-	1.387242
			(0.000)*
Interest Rates	INT	0.007966	-0.0108380
		(07993)	(0.7357)
	Adjusted R^2	0.635587	0.630492
	F stat	77.16078	75.50851
	Prob(F-stat)	(0.000)*	(0.0000)*
	DW	2.012342	1.933826

Table 6 presents OLS regression estimations. Interesting and new findings emerge. Estimations from the variant of the baseline specification show that Money Supply (M2) is an important determinant of the variations in the stock returns. The variable is significant at 5% level of significance. A plausible interpretation of these results is that an increase in money supply boosts stock returns. This is consistent with the previous evidence of a positive and significant linkage between money supply and stock returns Maysami et al. (2004). This is also in consistence with the theory since an increase in money means that

money demand is increasing which is a signal of an increase in economic activity. This increase in economic activity implies higher cash flows, which causes stock prices to rise. The stimulated economy leads to greater credit being available to firms to expand production and then increases sale resulting in increased earnings for firms which results in better dividend payments for firms leading to an increase in the price of stocks.

We find a negative and significant relationship between exchange rate and stock prices. This suggests that depreciation of our local currency will cause the stock price to fall. This finding contradicts Rad, (2011) whose results showed a weak relationship between the market and exchange rates and Richards and Evans, (2009) who also found a strong positive relationship between the two variables in Australia. Abraham, (2010) also reports a positive but not significant relationship between stock market returns and exchange rates in short run, while in the long run, the relationship was not significant. The empirical evidence presented here is in contrast to most studies undertaken in the developing countries.

Another new and interesting finding is that Inflation positively influences stock returns. This is in sharp contrast to economic theory which stipulates a negative impact of inflation on stock market returns. The result confirms Owusu-Nantwi and Kuwornu (2011) for Ghana using monthly time series data but is inconsistent withReddy (2012) who found a negative impact of inflation in India, as well as Bordo et al. (2008) who found that inflation have large negative impact on stock market conditions in the United States. However, the impact of inflation on equity prices is a matter of considerable debate both theoretically and empirically. This debate is motivated partially by the theory that the stock market provides an effective hedge against inflation, Bodie(1976). The argument that the stock market serves as a hedge against inflation is based on the fundamental idea of Irving Fisher (1930), and is known as the Fisher Effect. The Fisher Effect states that in the long run, inflation and the nominal interest rate should move one-to-one with expected inflation. This implies that higher inflation will increase the nominal stock market return, but the real stock return remains unchanged. Therefore, investors are fully compensated. We also establish that interest rate is not significant in explaining stock market returns contrary to our hypothesis in Table 2.

3.5 Diagnostic Tests

In order to check the adequacy of a chosen model, researchers can apply a range of diagnostic tests, each of which is designed to detect a particular form of model inadequacy the correct specification of the model. The purpose of any test is to accurately control the probability of wrongly rejecting the null hypothesis, while at the same time ensuring a high probability of correctly rejecting the null hypothesis. The regression model of the stock returns (dependent variable) against values of Money Supply (M2), Exchange Rates, Consumer Price Index (Inflation) and Treasury bill rate was estimated and the results are reported in Table 6.

3.5.1 Test for Autocorrelation

The Diagnostic tests for the estimated variables reported in **Table 7** indicate the serial correlation among the estimated variables. Serial correlation is a statistical term used to describe the situation when the residual is correlated with lagged values of itself which is not desirable. This study adopted Breusch-Godfrey Serial Correlation LM Test to test for the presence of serial correlation on the residuals. The null hypothesis is of no serial correlation.

Table 7: Breusch-Godfrey Serial Correlation LM test:

F-statistic	0.015353	Prob. F(2,125)	0.9848
Obs*R-squared	0.032418	Prob. Chi-Square(2)	0.9839

From the results in **Table 7** and in the Appendix, the p-value is 0.9848 (98%) which is more than 5 per cent (p>0.05), hence null hypothesis could not be rejected. This means that residuals (u) are not serially correlated which is desirable.

3.5.2 Test for Heteroscedasticity

Heteroscedasticity is a term used to describe the situation when the variance of the residuals from a model is not constant. Breusch-Pegan-Godfrey test (B-P-G Test) was used to test for the presence of Heteroscedasticity.

Table 8: Heteroscedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.005834	Prob. F(4,127)	0.0976
Obs*R-squared	7.843682	Prob. Chi-Square(4)	0.0975
Scaled explained SS	15.22082	Prob. Chi-Square(4)	0.0043

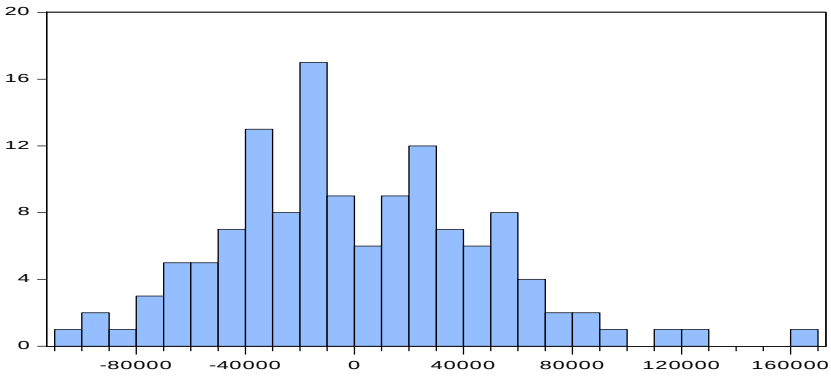
Source: Author

Table 8reports a p-value of 0.0975 (9.8%) which is more than 5 per cent (p>0.05) shows that null hypothesis of homoscedasticity cannot be rejected. This implies that the residuals have constant variance which is desirable.

3.5.3 Distribution of Residuals

One of the assumptions of the method of OLS is about the probability distribution of residuals. OLS estimators of the regression coefficients are best linear unbiased estimators if the residuals follow the normal distribution with zero mean and constant variance.Jarque-Berra statistics was used to test for normality.

Table 9: Residual Normality Test



Series: Residuals	
Sample 2003M02 2013M12	
Observations 131	
Mean	-3.11e-10
Median	-6639.217
Maximum	162515.4
Minimum	-104136.1
Std. Dev.	47469.07
Skewness	0.431677
Kurtosis	3.398523
Jarque-Bera	4.935437
Probability	0.084778

Table 9 shows the results of normality test. The Jarque-Bera value of 4.935437 and the corresponding p value is 0.084778 indicate a desirable distribution of the residuals. Since p value is greater than 5 percent the null hypothesis of normal distribution cannot be rejected meaning that population residual is normally distributed which fulfills the assumption of a good regression line.

In order to make a generalization of the findings based on the model, the residual normality test should be able to tell that the errors are normally distributed. The Jaque-Bera test indicate the normality of the error term, hence the errors are normally distributed across and do not participate on the final conclusions of the results.

5. SUMMARY, CONCLUSION AND RECOMMENDATION

This study investigated the macroeconomic determinants of the stock market performance proxied by the returns of the NSE-20 share index. This was achieved by using monthly data for the period January 2003 to December 2013. While most information on the development and reforms at NSE is highly fragmented, this study has taken a first empirical step to synthesize the information to better understand the link between macroeconomic fundamentals and stock returns.

The financial and economic literature advanced earlier in this study such as Capital Asset Pricing Model (CAPM) and the arbitrage price theory (APT) both imply a relationship between the stock market and economic activity. However, these theories have been silent about determining which precise events or economic factors are likely to influence asset prices. Accordingly, the macroeconomic variables included in this analysis were selected based upon the APT theory which advocates for multifactor analysis. This implies that all essential factors that may directly or indirectly affect the expected returns and subsequently affect the stock prices may be analysed.

We find evidence that stable macroeconomic environment matters. The empirical analysis found two interesting results. First, all variables are I(0). Second, with the exception of interest rates, there exists a significant relation between stock market returns and macroeconomic variables.

According to the findings of the study, Money Supply, exchange rates and inflation affect the stock market returns in Kenya. Money supply and inflation are found to be significant determinants of the returns at NSE. Exchange rates is however, found to have a negative impact on stock returns, while interest rates is not important in determining long rung run returns in the NSE.

Based on the OLS results for this study, the long run impact of money supply on stock returns in Kenya postulate that an increase in money supply causes stock market returns to increase indicating that the increase results in expanded productions by companies and then increases sale resulting in increased earnings for firms which results in better dividend payments for firms leading to an increase in the price of stocks. The significant positive relationship for Money supply (M2) on stock returns was not surprising, since the existing theoretical and empirical studies showed no consensus regarding the relationship between money supply and the stock market prices (returns). Thus, it can be concluded that these findings may be considered as an indication that the money supply's relationship with NSE 20-Share index is an empirical question.

The impact of exchange rate on stock returns in Kenya has been established by this study to be negative and significant. The results present a rich ground for the CBK in mastering the relationship between exchange rates and share prices. This may help them employ the monetary policy tools at their disposal to maintain the exchange rates stability in Kenya and consequently averting adverse effect on the stock market returns on the finding of this research.

The results of the study reveal a positive impact of inflation (CPI) on stock market returns for the ten year period investigated, this imply that in Kenya stocks cannot be used as a hedge against inflation, since the positive regression coefficient implies a higher expected return is required for higher inflation. The rationale for this pattern is related to the inadequacy of hedging role of stock against inflation in Kenya. This therefor impose on The Central Bank of Kenya a role to make sure that rate of inflation in Kenya is kept within the range that would motivate investments since the variable has a great impact on investors; the investors are faced with the decision as to whether to make investments or not. Increase in inflation rate can cause the real income to decline, when this happens, the investor end up selling their assets, including stocks to improve their buying power. On the other hand, following from the coefficient of this variable, it can be concluded that inflation in Kenya is within the desired or investor friendly levels; this is because of the co-movement with the returns realized at the NSE.

Final but not least, the results of this study indicated that Interest rates (91-Day T bill) do not impact the returns on the stock market returns in Kenya. The implication of this may reveal that investors in Kenya do not take the government bills as the opportunity cost of holding shares and as a benchmark for measuring interest rate.

5.1 Recommendation and policy implication

The findings of this study have some important policy implications. First, exchange rate contains some significant information to forecast stock market performance. Therefore, Central Bank of Kenya (CBK) should try to maintain a healthy exchange rate. Second, Money supply and Inflation are major factors affecting stock markets; therefore CBK should try to control them through Repo and Reverse Repo rates. Finally, autonomous regulatory bodies such as Capital Markets Authority and visionary system of government can contribute towards the development of an efficient working and development of the Kenyan Stock Market.

The listed firms in the Nairobi Securities Exchange should endeavor to make their stocks attractive to investors who may prefer investment in securities as a hedge for longer periods of investment. For this regard therefore, the firms should invest in projects that are long term and viable for long term returns to investors. Once it is realized by investors that listed firms have a superior

performance coupled with the fact that returns on their shares increases as inflation goes up, the shares may be preferred assets when investors have to hedge against the risk of inflation.

The results of the study are not consistently stable with the results of the previous studies due to differences between the macroeconomic factors used, the period covered, the research methodology employed and the countries examined. For the future research, it is recommended that there is need to repeat this study taking into account these kinds of differences to make the result of studies more comparable. In addition, some other macroeconomic variables would provide more information about the stock market returns - economic activity relationship. The inclusion of other macroeconomic variables in the model provides an avenue for future research. Further, a more robust and consistent estimates of the effects of macroeconomic variables on stock market returns could be attained by employing the vector error correction and cointegration analysis which were not feasible for the data series used in this study. The methodology provides both the short run and long run estimates of the effects of macroeconomic variables on stock market returns. This provides another avenue for future research in Kenyan domain.

Finally, a possible extension of this study should be carried out to consider the impact of other macroeconomic variables such as GDP or Money supply as a percentage of the GDP and the government spending, which were not included in the analysis because monthly data for these variables are not currently available. In fact, inclusion of these variables would be a significant addition to account for the impact of real activity and the effect of the public sector, given that the Kenyan government plays a major role and has a stake in ownership of the trading firms in the NSE.

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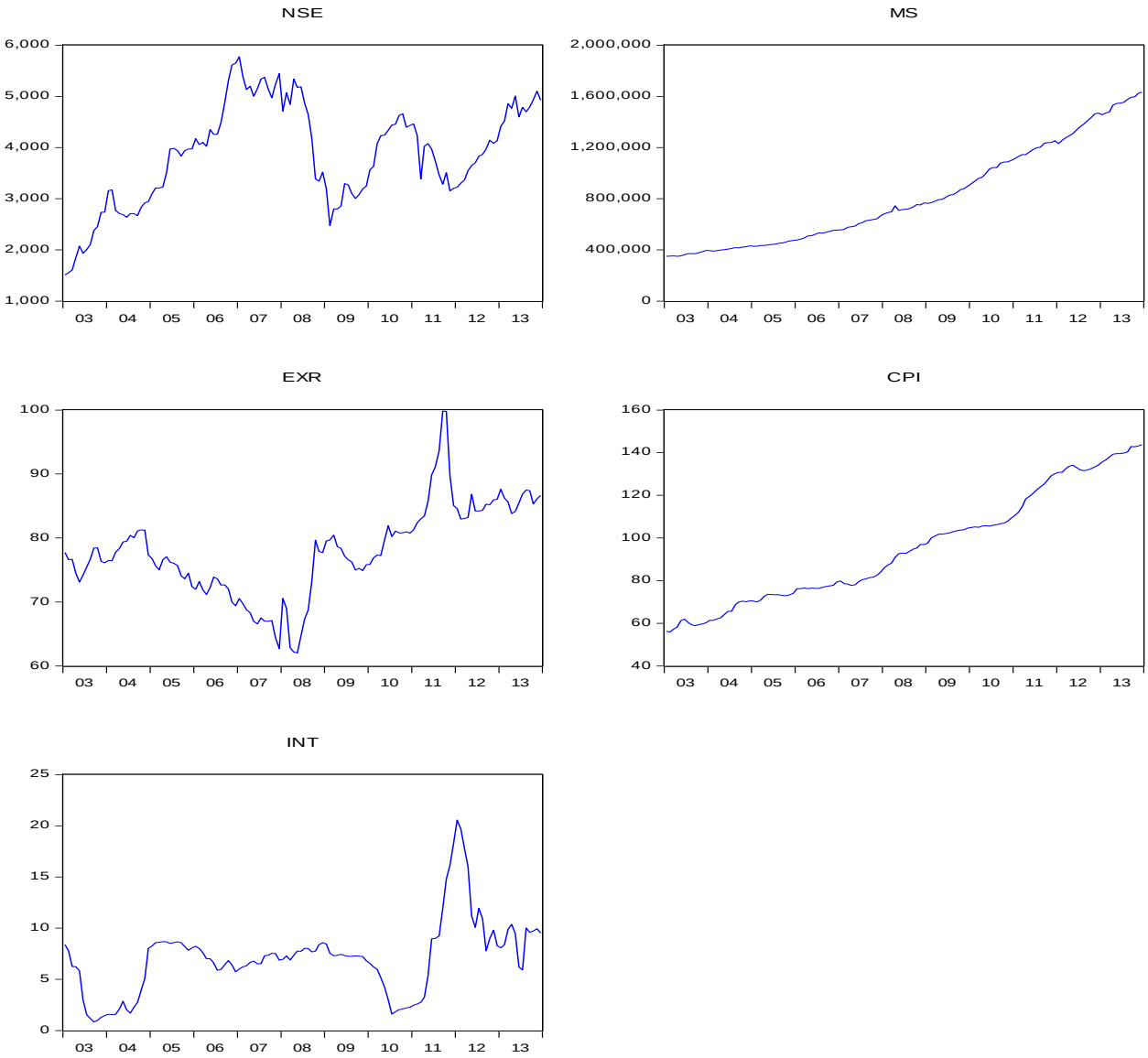
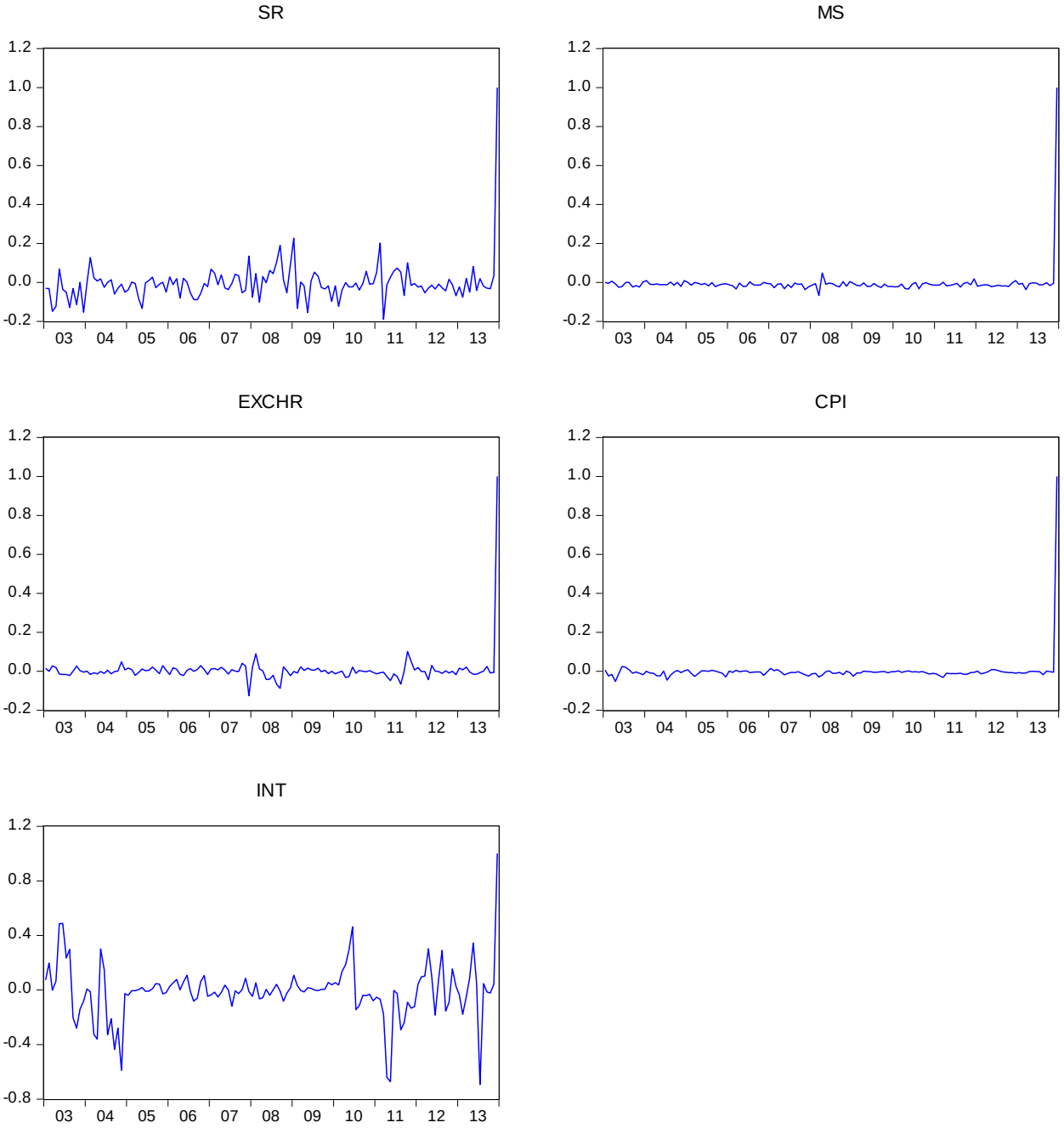
Appendices

Appendix 1: Graphical Analysis of the series



Appendix 2: Stationarity Graphs (after the data is log differenced)



Appendix 3: Stock Returns (NSE 20-Share Index) Unit Root Test

Null Hypothesis: SR has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.22794	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(SR)

Method: Least Squares

Date: 05/05/14 Time: 06:50

Sample (adjusted): 2003M02 2013M11

Included observations: 130 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SR(-1)	-0.900869	0.088079	-10.22794	0.0000
C	0.007930	0.005583	1.420432	0.1579

R-squared	0.449724	Mean dependent var	-0.000503
Adjusted R-squared	0.445425	S.D. dependent var	0.084534
S.E. of regression	0.062953	Akaike info criterion	-2.677605
Sum squared resid	0.507267	Schwarz criterion	-2.633489
Log likelihood	176.0443	Hannan-Quinn criter.	-2.659680
F-statistic	104.6107	Durbin-Watson stat	2.006565
Prob(F-statistic)	0.000000		

Appendix 4: Unit Root Test Results for Money Supply (M2)

Null Hypothesis: MS has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.84488	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(MS)

Method: Least Squares

Date: 05/05/14 Time: 06:53

Sample (adjusted): 2003M02 2013M11

Included observations: 130 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS(-1)	-1.196570	0.086427	-13.84488	0.0000
C	0.014659	0.001507	9.727694	0.0000

R-squared	0.599600	Mean dependent var	4.22E-05
Adjusted R-squared	0.596472	S.D. dependent var	0.019300
S.E. of regression	0.012260	Akaike info criterion	-5.949627
Sum squared resid	0.019240	Schwarz criterion	-5.905511
Log likelihood	388.7258	Hannan-Quinn criter.	-5.931701
F-statistic	191.6807	Durbin-Watson stat	2.012609
Prob(F-statistic)	0.000000		

Appendix 5: Unit Root Test Results for Exchange Rates

Null Hypothesis: EXCR has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.947817	0.0000
Test critical values:	1% level	-3.481623	
	5% level	-2.883930	
	10% level	-2.578788	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXCR)

Method: Least Squares

Date: 05/05/14 Time: 06:54

Sample (adjusted): 2003M03 2013M11

Included observations: 129 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCR(-1)	-0.986455	0.110245	-8.947817	0.0000
D(EXCR(-1))	0.223426	0.086742	2.575742	0.0112
C	0.001229	0.002221	0.553421	0.5810

R-squared	0.432905	Mean dependent var	4.45E-05
Adjusted R-squared	0.423904	S.D. dependent var	0.033179
S.E. of regression	0.025183	Akaike info criterion	-4.502317
Sum squared resid	0.079907	Schwarz criterion	-4.435809
Log likelihood	293.3994	Hannan-Quinn criter.	-4.475293
F-statistic	48.09258	Durbin-Watson stat	1.912303
Prob(F-statistic)	0.000000		

Appendix 6: Unit Root Test results for CPI (Inflation)

Null Hypothesis: CPI has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.898130	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(CPI)

Method: Least Squares

Date: 05/05/14 Time: 06:57

Sample (adjusted): 2003M02 2013M11

Included observations: 130 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI(-1)	-0.649945	0.082291	-7.898130	0.0000
C	0.004807	0.001062	4.526233	0.0000

R-squared	0.327662	Mean dependent var	8.02E-05
Adjusted R-squared	0.322409	S.D. dependent var	0.012152
S.E. of regression	0.010003	Akaike info criterion	-6.356658
Sum squared resid	0.012807	Schwarz criterion	-6.312542
Log likelihood	415.1828	Hannan-Quinn criter.	-6.338732
F-statistic	62.38046	Durbin-Watson stat	1.858784
Prob(F-statistic)	0.000000		

Appendix 7: Unit Root Test Results for Interest Rates (91- T Bill rates)

Null Hypothesis: INT has a unit root

Exogenous: Constant

Lag Length: 11 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.472045	0.0104
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INT)

Method: Least Squares

Date: 05/05/14 Time: 06:59

Sample (adjusted): 2004M01 2013M11

Included observations: 119 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT(-1)	-0.683195	0.196770	-3.472045	0.0007
D(INT(-1))	0.260272	0.176983	1.470605	0.1444
D(INT(-2))	0.007773	0.170065	0.045704	0.9636
D(INT(-3))	0.159550	0.165744	0.962629	0.3379
D(INT(-4))	0.214031	0.152998	1.398916	0.1648
D(INT(-5))	0.155705	0.152173	1.023215	0.3085
D(INT(-6))	0.077756	0.143849	0.540542	0.5900
D(INT(-7))	0.314026	0.132249	2.374506	0.0194
D(INT(-8))	0.021970	0.131975	0.166475	0.8681
D(INT(-9))	0.296673	0.126587	2.343626	0.0210
D(INT(-10))	0.162517	0.113025	1.437886	0.1534
D(INT(-11))	-0.300172	0.108601	-2.763999	0.0067

C	0.027492	0.081036	0.339250	0.7351

R-squared	0.586557	Mean dependent var	-0.004538
Adjusted R-squared	0.539752	S.D. dependent var	1.293492
S.E. of regression	0.877525	Akaike info criterion	2.679381
Sum squared resid	81.62533	Schwarz criterion	2.982982
Log likelihood	-146.4231	Hannan-Quinn criter.	2.802664
F-statistic	12.53198	Durbin-Watson stat	2.016482
Prob(F-statistic)	0.000000		

Appendix 8:Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.015353	Prob. F(2,125)	0.9848
Obs*R-squared	0.032418	Prob. Chi-Square(2)	0.9839

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 04/26/14 Time: 14:51
Sample: 2003M01 2013M12
Included observations: 132
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS	-0.007323	0.371291	-0.019723	0.9843
EXCHR	-0.000643	0.218598	-0.002942	0.9977
CPI	0.007617	0.376276	0.020244	0.9839
INT	0.000732	0.032156	0.022749	0.9819
C	-1.67E-05	0.006268	-0.002667	0.9979
RESID(-1)	-0.001798	0.090004	-0.019980	0.9841
RESID(-2)	0.015891	0.091418	0.173831	0.8623

R-squared	0.000246	Mean dependent var	-5.31E-18
Adjusted R-squared	-0.047743	S.D. dependent var	0.064613
S.E. of regression	0.066138	Akaike info criterion	-2.542578
Sum squared resid	0.546777	Schwarz criterion	-2.389702
Log likelihood	174.8102	Hannan-Quinn criter.	-2.480456
F-statistic	0.005118	Durbin-Watson stat	2.000334
Prob(F-statistic)	0.999999		

Appendix 9: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.005834	Prob. F(4,127)	0.0976
Obs*R-squared	7.843682	Prob. Chi-Square(4)	0.0975
Scaled explained SS	15.22082	Prob. Chi-Square(4)	0.0043

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/26/14 Time: 14:54

Sample: 2003M01 2013M12

Included observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004739	0.000794	5.967641	0.0000
MS	0.115935	0.046478	2.494430	0.0139
EXCHR	-0.002474	0.027671	-0.089404	0.9289
CPI	-0.123513	0.047276	-2.612583	0.0101
INT	0.004505	0.004044	1.113999	0.2674

R-squared	0.059422	Mean dependent var	0.004143
Adjusted R-squared	0.029797	S.D. dependent var	0.008516
S.E. of regression	0.008388	Akaike info criterion	-6.686833
Sum squared resid	0.008936	Schwarz criterion	-6.577636
Log likelihood	446.3310	Hannan-Quinn criter.	-6.642461
F-statistic	2.005834	Durbin-Watson stat	1.699004
Prob(F-statistic)	0.097587		

Appendix 10 : OLS results for SR without CPI

Dependent Variable: SR

Method: Least Squares

Date: 05/11/14 Time: 14:42

Sample: 2003M01 2013M12

Included observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MS	1.394099	0.216045	6.452815	0.0000
EXCHR	-0.432045	0.209447	-2.062790	0.0412
INT	0.007966	0.031258	0.254841	0.7993
C	0.005136	0.006184	0.830448	0.4078

R-squared	0.643932	Mean dependent var	-0.003598
Adjusted R-squared	0.635587	S.D. dependent var	0.109777
S.E. of regression	0.066269	Akaike info criterion	-2.560357
Sum squared resid	0.562121	Schwarz criterion	-2.472999
Log likelihood	172.9835	Hannan-Quinn criter.	-2.524858
F-statistic	77.16078	Durbin-Watson stat	2.012342
Prob(F-statistic)	0.000000		

Appendix 11: OLS Results for SR without Money Supply

Dependent Variable: SR

Method: Least Squares

Date: 05/11/14 Time: 14:46

Sample: 2003M01 2013M12

Included observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXCHR	-0.398306	0.209996	-1.896730	0.0601
CPI	1.387242	0.221288	6.268948	0.0000
INT	-0.010838	0.032041	-0.338269	0.7357
C	-0.001669	0.005949	-0.280509	0.7795

R-squared	0.638954	Mean dependent var	-0.003598
Adjusted R-squared	0.630492	S.D. dependent var	0.109777
S.E. of regression	0.066731	Akaike info criterion	-2.546472
Sum squared resid	0.569981	Schwarz criterion	-2.459114
Log likelihood	172.0671	Hannan-Quinn criter.	-2.510974
F-statistic	75.50851	Durbin-Watson stat	1.933826
Prob(F-statistic)	0.000000		